

Late Pliocene Bustards (Aves: Otitidae) from Western Bulgaria

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Introduction

No fossil taxa of the Otitidae species have been reported from Bulgaria so far. All Tertiary (Late Neogene) remains of bustards from this country originate from the Late Pliocene site near the town of Varshets (BOEV, 1996). The Quaternary record of Otitidae in Bulgaria is more abundant (BOEV, 1997; in press). The present paper describes the first fossil remains of bustards of pre-Pleistocene age.

Material

A total of 7 bone remains were collected from the site in 1989-1994 by the author. All finds are kept at the Fossil and Recent Birds Department of the National Museum of Natural History, BAS in Sofia, Coll. Nos: NMNHS 140-142; 148-149; 151; 156.

Description and comparison of the Bulgarian finds

Locality: A ponor in a rocky hill, 6 km NNE of Varshets (43 13 N, 23 17 E).

Horizon: Unconsolidated unstratified sediments accumulated in the filling of clay terra-rossa. The fossil bones are broken, sometimes making a kind of bone breccia.

Chronostratigraphy: Middle Villafranchian. The associated mammalian fauna attributes the site to the MN 17 zone (SPASSOV, 1997; V. POPOV - pers. comm.).

Otis aff. *khosatzkii* Bochenski et Kurochkin, 1987

The Bulgarian finds show unambiguously the morphological features of bus-



Fig. 1. *Otis* aff. *khosatzkii*: tarsometatarsus sin. dist., NMNHS 142 - cranial view (a) and caudal view (b); femur dex. dist., NMNHS 156 - medial view (c), cranial view (d) and caudal view (e) (Photographs: Boris Andreev)

Table 1

**Measurements of distal tarsometatarsus in fossil and recent Otitidae
(ref. to Fig. 5-a)**

Species	a	b	c	d	e	f
Fossil						
<i>Otis</i> aff. <i>khosatzkii</i> NMNHS 142	18,5	5,0	5,8	8,2	6,5	7,2
Recent						
<i>Otis tarda</i> UCBL 144/1	23,8	7,4	8,1	12,0	9,8	9,7
<i>Otis tarda</i> NHMT 1875/784	25,2	-	-	12,3	-	-
<i>Otis tarda</i> NHMT 1875/784	24,7	-	-	-	-	9,0
<i>Otis tarda</i> NHMT 99	19,0	-	-	-	-	9,0
<i>Otis tarda</i> NHMT 98	20,6	-	-	-	-	7,5
<i>Otis tarda</i> NHMT 1858/2.3.6.	10,5	-	-	-	-	4,4
<i>Otis tarda</i> NHMT 99.1.31.2.	19,0	-	-	-	-	9,0
<i>Otis tarda</i> NHMT 98.6.3.1.	25,1	-	-	-	-	9,4
<i>Otis tarda</i> NHMT AC A4436	19,7	-	-	-	-	7,8
<i>Otis tarda</i> NHMT	11,4	-	-	-	-	-
<i>Otis tarda</i> NHMT	20,1	-	-	-	-	-
<i>Otis tarda</i> Akrotiri	24,7	-	-	-	-	10,0
<i>Otis tarda</i> Akrotiri	25,2	-	-	-	-	12,3
<i>Otis tarda</i> Akrotiri	27,5	-	-	12,9	-	-
<i>Otis tarda</i> Akrotiri	25,0	-	-	11,15	-	-
<i>Otis tarda</i> Regalia 675	18,3	-	-	-	-	7,3
<i>Tetrax tetrax</i> UCBL 145/1	11,0	3,4	3,5	5,3	4,2	4,6
<i>Chlamydotis undulata</i>						
NHMT 1846/4.4.6.	16,0	-	-	-	-	5,4
<i>Chlamydotis undulata</i> NHMT 1846	13,6	-	-	-	-	4,8
<i>Chlamydotis undulata</i> NHMT 1846	15,6	-	-	-	-	5,4

tards. The dimensions of the Varshets form lie between the dimensions of the recent Great Bustard *O. tarda* and the Little Bustard *Tetrax tetrax*.

Tarsometatarsus sin. dist., NMNHS 142 (Fig. 1 a, b): The total length of the fragment is 40,0 mm. The find has all morphological features of a distal tarsometatarsus of a bustard of g. *Otis*. Its dimensions (Table 1) stand between these of *Tetrax tetrax* and *Otis tarda*. The Varshets specimen is larger than *Chlamydotis undulata*. The juvenile/subadult females of *O. tarda* are the closest specimens dimensionally. The find No 142 is also a subadult individual, but it differs clearly from *O. tarda* by its deeper fovea ligamenti collateralis. It is only slightly marked in *O. tarda*. Therefore, it stands closer to *T. tetrax*. The find differs both from *T. tetrax* and from *O. tarda* by the sharp caudal edge of the trochlea metatarsi III.

Femur dex. dist., NMNHS 156 (Fig. 1 c, d, e): The general shape and morphological details correspond to g. *Otis*. The fragment belongs to a subadult individual. Besides the metrical differences (Table 2), the find differs from *O. tarda* and *T. tetrax* by the sharper caudal edge of condylus medialis which is round in both recent species. The NMNHS 156 find stands closer to *T. tetrax* with its sharper

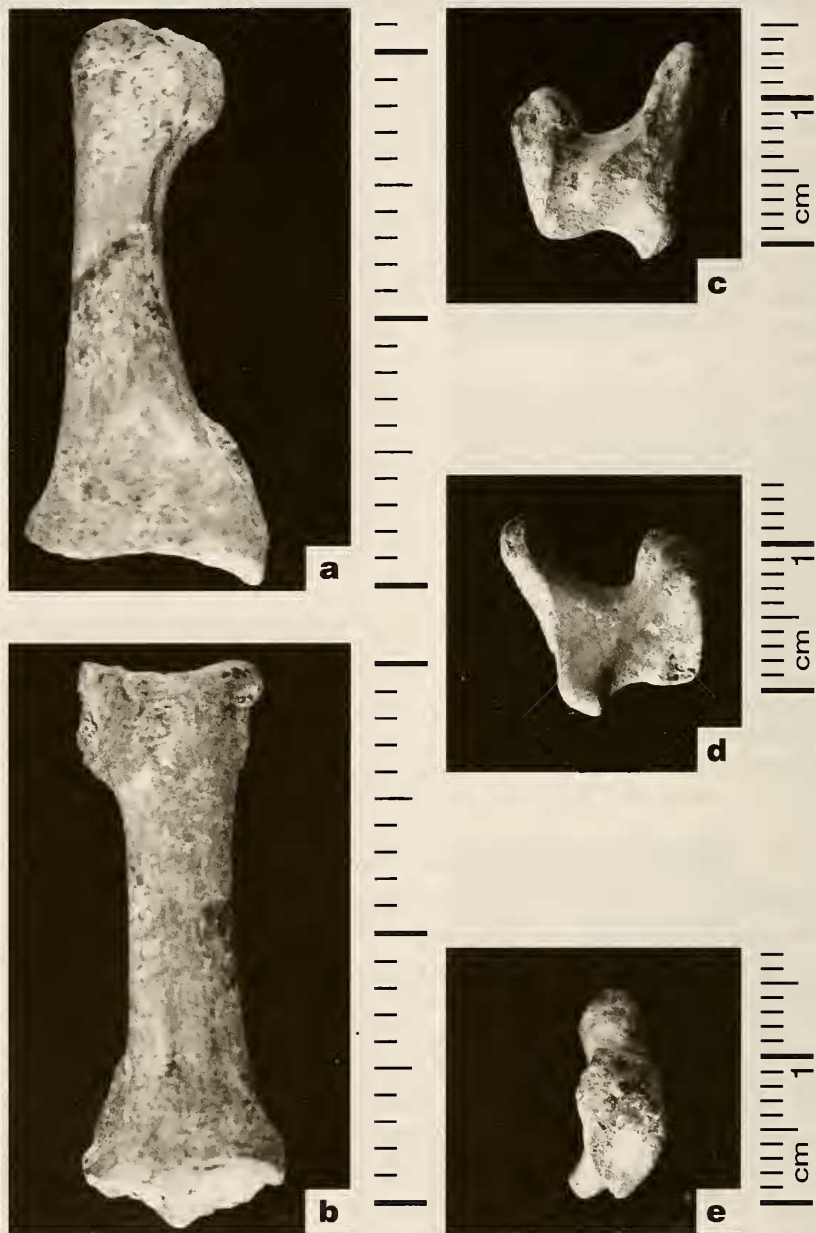


Fig. 2. *Otis* aff. *khosatzkii*: phalanx 1 dig. I pedis dex., NMNHS 141 - lateral view (a) and dorsal view (b); os ulnare dex., NMNHS 149 - dorsal view (c), ventral view (d) and cranial view (e) (Photographs: Boris Andreev)

projection on the cranial face of condylus medialis. Epicondylus lateralis is more protruded in comparison with *O. tarda* - a clear distinction from the recent Great Bustard. TCHERNOV (1962) describes a find of „*Otis* sp. nov. ?“ from the Kebara Cave in Palestine (Upper Levallaiso-Mousterian), dated 100 000 B.P. It is larger than *T. tetrax* and *Chl. undulata* and little bit smaller than *O. tarda*. The minimum width of the femur distal epiphysis of No NMNHS 156 is 14 mm, while in the Palestine specimen this measurement is 27 mm. *O. tarda*, *T. tetrax* and *Ch. undulata* are the only recent bustards in the Mediterranean zone of the Western Palearctic. Due to the geochronological difference we also can't refer the Varshets remain to any of these species, as it is also seen from the Table 2.

Phalanx 1, dig. I pedis dex., NMNHS 141 (Fig. 2 a, b) and phalanx 1, dig. I pedis sin., NMNHS 140: Both finds differ from *O. tarda* and *T. tetrax* by their stronger asymmetry of the facies articularis proximalis. The proximal end of the phalanges has a sharper projection in lateral view and a well developed fovea in the distal end on the ventral side. In *Otis* it is only poorly marked. The ventral edge of the facies articularis proximalis of both finds has a sharp point in its medial part, which is absent in *Otis* and *Tetrax*. Measurements: Table 3.

Os ulnare, NMNHS 149 (Fig. 2 c, d, e): The general shape and size of the bone resembles *O. tarda*, although some morphological details suggest a taxonomical difference. Measurements: Table 4.

Otitidae gen. indet.

Radius sin. distr., NMNHS 151 (Fig. 3): Total length - 21,4 mm. The find belongs to a juvenile individual. Morphologically it corresponds to *T. tetrax*, but dimensionally (Table 5) it is much bigger and possibly belongs to other species of bigger size. Due to the bad preservation (lacking the distal part of the distal epiphyses), the find can not be determined any further.

Tibiotarsus dex. dist., NMNHS, No 148: Only the diaphysal part is preserved. The medial side has a medial bend in cranial view, similar to *T. tetrax*. Sulcus extensorius is also practically identical to that of *T. tetrax*. The presence of an edge and a foramen distinguishes the fossil specimen from the Little Bustard. The measurement „c“ (Table 6) is very approximative.



Fig. 3. Otitidae gen. indet.: radius sin. distr., NMNHS 151 - ventro-lateral view (Photograph: Boris Andreev)



Fig. 4. Geographical range of *Otis khosatzkii*: 1 - Etulya in SW Moldova (after BOCHENSKI & KUROCHKIN, 1987); 2 - Beremend in S Hungary (after JANOSSY, 1991); 3 - Polgardi in S Hungary (after JANOSSY, 1991), 4 - Varshets in NW Bulgaria (present paper)

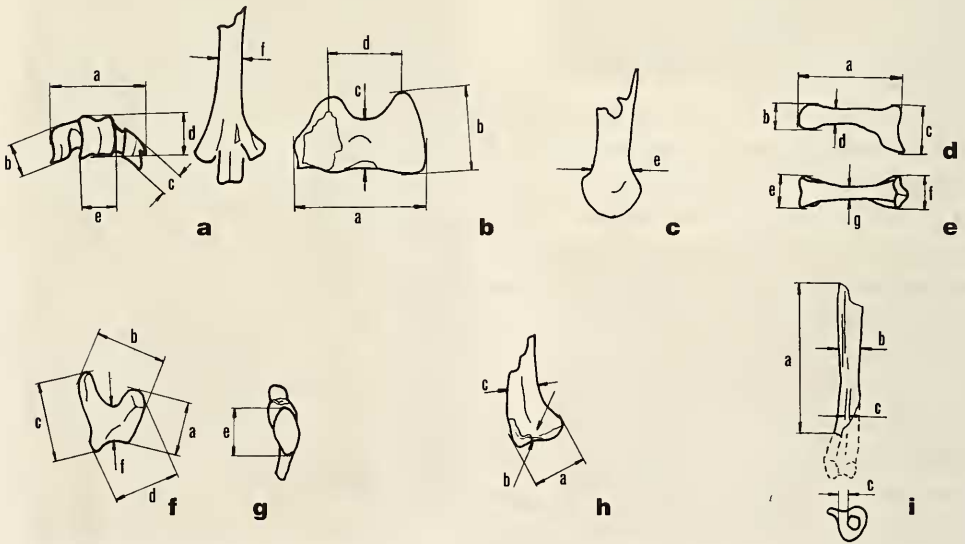


Fig. 5. Manner of measuring of the Bustards bone remains: a - tarsometatarsus dist.; b, c - femur dist.; d, e - phalanx dig. pedis, f, g - ulnare, h - radius dist., i - tibiotarsus dist. (Drawings: Vera Hristova)

Table 2

Measurements of distal femur in fossil and recent Otitidae (ref. to Fig. 5 b, c)

Species	a	b	c	d	e
Fossil					
<i>Otis</i> aff. <i>khosatzkii</i> NMNHS 156	21,8	16,3	10,3	10,9	10,4
Recent					
<i>Otis tarda</i> UCBL 144/1	30,8	27,2	15,3	16,2	19,3
<i>Otis tarda</i> UCBL	25,6	21,1	-	-	-
<i>Otis tarda</i> UCBL	32,3	27,1	-	-	-
<i>Otis tarda</i> Akrotiri	30,6	24,2	-	-	-
<i>Otis tarda</i> Akrotiri	34,0	29,1	-	-	-
<i>Otis tarda</i> Akrotiri	22,0	18,2	-	-	-
<i>Otis tarda</i> Akrotiri	24,0	21,1	-	-	-
<i>Otis tarda</i> Akrotiri FN/850	22,1	18,7	-	-	-
<i>Otis tarda</i> Akrotiri FN/385	22,0	18,2	-	-	-
<i>Otis tarda</i> Akrotiri FN/685	-	19,8	-	-	-
<i>Otis tarda</i> Akrotiri FN/685	34,0	27,7	-	-	-
<i>Otis tarda</i> Akrotiri FN/866	33,2	29,1	-	-	-
<i>Otis tarda</i> Akrotiri FN/866	-	19,0	-	-	-
<i>Otis tarda</i> Akrotiri FN/871/Q	24,0	21,1	-	-	-
<i>Otis tarda</i> Akrotiri FN/367	30,6	24,2	-	-	-
<i>Otis tarda</i> NHMT 99	23,2	18,4	-	-	-
<i>Otis tarda</i> NHMT 98	23,3	18,5	-	-	-
<i>Otis tarda</i> NHMT 26	25,8	20,4	-	-	-
<i>Otis tarda</i> NHMT 99/1.31.2.	18,4	10,1	-	-	-
<i>Otis tarda</i> NHMT 1898/ 9.18.1.	18,5	9,6	-	-	-
<i>Otis tarda</i> NHMT 98/6.3.1.	23,8	13,2	-	-	-
<i>Otis tarda</i> NHMT 98	30,8	23,8	-	-	-
<i>Otis tarda</i> NHMT 1926/1.27.2.	20,4	10,8	-	-	-
<i>Otis tarda</i> NHMT 1846/4.4.6.	18,4	14,3	-	-	-
<i>Otis tarda</i> NHMT 1869/10.19.16.	16,0	12,1	-	-	-
<i>Otis tarda</i> NHMT 1869/10.19.15.	18,8	14,2	-	-	-
<i>Otis tarda</i>	20,3	18,2	-	-	-
<i>Otis tarda</i>	25,8	20,4	-	-	-
<i>Otis tarda</i> AME	25,6	21,1	-	-	-
<i>Otis tarda</i> AC 1875/184	31,0	25,2	-	-	-
<i>Otis tarda</i> AC A/4436	22,8	18,9	-	-	-
<i>Otis tarda</i> AC A/4436	18,9	12,3	-	-	-
<i>Otis tarda</i> Regalia 533	23,7	-	-	-	-
<i>Otis tarda</i> Regalia 655	18,2	9,8	-	-	-
<i>Otis tarda</i> Regalia 675	18,2	9,8	-	-	-
<i>Otis tarda</i> Regalia 533	-	10,9	-	-	-
<i>Tetrax tetrax</i> UCBL 145/1	12,0	10,5	6,4	6,4	7,2
<i>Tetrax tetrax</i> IPP	11,7	10,0	-	-	-
<i>Tetrax tetrax</i> UCBL 145/2	10,8	6,1	-	-	-
<i>Tetrax tetrax</i> NHMT 1858/2.3.6.	10,1	5,4	-	-	-
<i>Tetrax tetrax</i> NHMT 62/3.19.10.	9,7	5,0	-	-	-
<i>Tetrax tetrax</i> NHMT	10,1	5,4	-	-	-
<i>Tetrax tetrax</i> AME	9,8	5,3	-	-	-

Table 3

Measurements of phalanx I dig. 1 pedis in fossil and recent Otitidae (ref. to Fig. 5 d, e)

Species	a	b	c	d	e	f	g
Fossil							
<i>Otis</i> aff. <i>khosatzskii</i> NMNHS 141	19,2	4,5	7,9	3,0	ca.7,2	6,6	3,8
<i>Otis</i> aff. <i>khosatzskii</i> NMNHS 140	19,8	4,8	8,6	3,0	7,0	7,0	3,8
Recent							
<i>Otis tarda</i> UCBL 144/1	28,3	6,7	12,4	5,2	9,8	11,0	6,4
<i>Tetrax tetrax</i> UCBL 145/1	14,3	3,8	5,3	2,1	3,7	4,2	2,5

Table 4

Measurements of os ulnare in fossil and recent Otitidae (ref. to Fig. 5 f, g)

Species	a	b	c	d	e	f
Fossil						
<i>Otis</i> aff. <i>khosatzskii</i> NMNHS 149	10,5	13,5	15,0	13,6	8,0	6,6
Recent						
<i>Otis tarda</i> UCBL 144/1	14,5	18,1	20,5	18,8	12,0	10,0
<i>Otis</i> sp. UCBL (Mas Rambault)	12,6	20,3	20,0	-	12,0	8,5

Discussion

BRODKORB (1967) lists only three fossil species from the Otitidae family: *Palaeotis weigelti* Lambrecht, 1928, from the Middle Eocene from Germany, *Chlamydotis affinis* (Lydekker, 1891) from the Lower Miocene (Tortonian) from Germany, and *Otis lambrechtii* Kretzoi, 1941 from the Early Pleistocene from Hungary and Romania and the Middle Pleistocene from Austria (TYRBERG, 1998). The first two species may be excluded because of the great difference in the age. Because of their size or the stratigraphical differences we would rather not compare our finds with *O. lambrechtii* (much larger according to JANOSSY, 1991) and *O. kalmani* Janossy, 1971 (considerably smaller according to the same author). The last species is known from MNQ 19 to MNQ 21 from Hungary, Romania and Czechia (TYRBERG, 1998). UMANSKAYA (1979) described *Miootis compactus* based on the carpometacarpus and the phalanx pedis from the Late Miocene near Odessa.

Of a particular interest are the two Upper Pliocene bustards, *O. khosatzskii* Bochenski and Kurochkin, 1987 and *Otis paratetrax* Bochenski and Kurochkin, 1987, both described from SW Moldova. *O. paratetrax* has the same size as *T. tetrax* and *O. kalmani*, while *O. khosatzskii* occupies an intermediate place in the range between *O. tarda* and *T. tetrax* (BOCHENSKI & KUROCHKIN, 1987), i.e. it is dimensionally closer to the Bulgarian finds. These authors write in its diagnosis: „Typical *Otis* of middle size. Its structure is very similar to the recent *Otis tarda* Linnaeus, 1758.“ (p. 175). In addition, BURCHAK-ABRAMOVICH and VEKUA (1981)

Table 5

Measurements of distal radius in fossil and recent Otitidae (ref. to Fig. 5 h)

Species	a	b	c
Fossil			
Otitidae gen. NMNHS 151	ca.13,5	1,6	7,0
Recent			
<i>Otis tarda</i> UCBL 144/1	17,2	7,1	11,0
<i>Tetrax tetrax</i> UCBL 145/1	6,6	2,8	4,8

Table 6

Measurements of distal tibiotarsus in fossil and recent Otitidae (ref. to Fig. 5 i)

Species	(a)	b	c
Fossil			
Otitidae gen. NMNHS 148	40,1	4,7	ca.1,3
Recent			
<i>Tetrax tetrax</i> UCBL 145/1	-	5,0	ca.1,5

described a new taxon *Ioriotis gabunii* from the Late Pliocene (Roman = Akchagulian) from Kvabebi, Eastern Georgia. The holotype is a proximal end of left humerus. *I. gabunii* was the largest known bustard (some of its measurements were of 30 % bigger than those of the adult males of *Otis tarda*. Possibly its flight was slow and difficult. Due to these dimensional differences this species does not deserve much attention. Later, SANCHEZ-MARCO (1990) described *Chlamydotis mesetaria* based on a single tibiotarsal bone from the Early Pliocene (Ruscinian, MN 14-15) from Spain - another incomparable taxon with the Bulgarian finds. Finally, KESSLER and GAL (1996) described a Middle („Upper“) Miocene (Middle Sarmatian) bustard, *Otis bessarabicus* by a distal left ulna from SE Romania. Dimensionally it was larger than *T. tetrax*, but much smaller than *O. tarda* and *O. affinis*. Besides the lack of homologous skeletal elements among the finds, there is a considerable chronological difference between the Varshets form and the *O. bessarabicus*, hence the last species can be excluded from our comparison.

Additionally undetermined *Otis* remains, besides these of *Otis agilis* Milne-Edwards, 1869, are established in Saint-Gerand-Le-Puy (Early Miocene, MN 2a) in France (CHENEVAL, 1996), *Otis* sp. - Late Miocene (MN 13) from Polgardi in Hungary (MLIKOVSKY, 1996a), Early Pliocene (MN 15) from Malusteni-Beresti in Romania (KESSLER, 1996) and Early Pliocene (MN 14) from Vojnicevo and Early Pliocene (MN 15) from the Odesa catacombs in Ukraine (MLIKOVSKY, 1996b).

As JANOSSY (1991) has summarized, at the end of Tertiary there was an evolutionary explosion of bustards, mainly in the Eastern part of Europe. He considers the Late Miocene (Pontian, MN 13) remains of *Otis khosatzkii* as the first proof of the presence of g. *Otis* in the region. Besides the large chronostrati-

graphical hiatus, JANOSSY (1991) described a subspecies, *O. k. beremendensis*, from the Early Villafranchian.

The finds of Varshets correspond best to this form both dimensionally and chronologically, so we refer them (NN 141-142, 149 and 156) to it, until additional material of homologous skeletal elements is collected or published from other sites of the species range.

Conclusion

The fossils of bustards are not numerous in the Tertiary sites. All finds of *Otis khosatzkii* originate from plain (Etulya, Polgardi), or hilly (Beremend, Varshets) regions of Central and SE Europe (Fig. 4). These regions are specific for all recent Otitidae species. The presence of bustard remains indicates an openland habitat with grass vegetation and scant bushes or scattered trees. The medium sized Khosatzkiy's bustards had probably been wide spread in the Late Pliocene throughout S and E Europe before the first Pleistocene glaciation events of considerable importance took place. According to the available data so far, its range encompassed the peri-Carpathian region (Hungary, Moldova, Bulgaria). On our opinion, the Khosatzki's Bustard was a species of (South-) East-European distribution.

Acknowledgments

I am very grateful to Dr. Cécile Mourer-Chauviré (Université Claude Bernard - Lyon 1) for the opportunity to work in the UCBL on fossil birds of Bulgaria and for the provided measurements of some bones of recent bustards. This work was partially sponsored by the Foundation Scientifique de Lyon et du Sud-Est (Lyon) and the National Science Fund (Sofia) (grant No B-202/1992).

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Received on 28.1.1998

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Късноплиоценски гропли (Aves: Otitidae) от Западна България

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(Резюме)

Терциерните находки от гропли са изключителна рядкост, въпреки че се смята, че еволюционният „взрив“ на гроплите се извършил през плиоцена. Всички фосилни останки от гропли в България произлизат от края на терциера (късен плиоцен; среден вилафранк, MN зона 17; отпреди около 2,3 млн.г.) от находището край гр. Вършец. Събрани са 7 кости и костни фрагменти и са представени техните размери, описания и сравнения. Част от материала (5 находки) е отнесена към терциерната гропла на Хозацкий (*Otis khosatzkii* Borchenski, Kurochkin, 1987) - вид с преходни размери между съвременните *Otis tarda* и *Tetrax tetrax*, известен от Средна и Източна Европа и конкретно - към подвида *O. kh. beremendensis* Janossy, 1991, описан от южна Унгария от находище със същата възраст като това край Вършец. Поради фрагментарността им, два от фосилите са определени само като *Otitidae* gen. indet. Въз основа на размерните различия на отделните находки, се допуска, че в материала, освен гроплата на Хозацкий, е представен и втори вид със значително по-едри размери. Находището край Вършец е 4-то известно находище на *O. khosatzkii* в света. То очертава пери-Карпатския ареал на вида в края на терциера (късният плиоцен). Намирането на гроплата на Хозацкий е индикация за наличието на открити равнинни тревисти и хълмисти редкообрасли предпланински местообитания в края на плиоцена.